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LINERLESS DISPENSING CAP

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This is a continuation-in-part of U.S. patent application Serial No. 10/342,556, filed January 15, 2003, which application is a division of Serial No. 09/974,434, filed October 10, 2001, now U.S. Patent No. 6,510,971, the disclosure of which is incorporated herein by reference.

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BACKGROUND OF THE INVENTION

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The invention relates to flap-type dispensing caps or closures for bottles, jars, and like containers.

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PRIOR ART

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U.S. Patent 4,693,399, now U.S. RE37,634, is an example of a screw-on two-flap dispensing cap with spoon (pour) and shake (sift) dispensing modes. This cap pioneered the use of a liner, initially carried in the cap, and sealed to the mouth of a container when the cap was screwed onto the container. The liner, before it is removed by the end user, serves to seal the container to limit moisture from passing into the container and its contents from escaping the container through unsealed parts of the cap in a manner sometimes described in the industry as "sifting".

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The referenced prior art cap and others similar to it have been provided with so-called clean-out plugs or skirts on the underside of the flap that fit into respective dispensing holes to reduce or eliminate the problem of these holes becoming plugged with the contents through use and to reduce objectionable "sifting" through the dispensing holes when the flaps are closed.

1 Prior art liners, while normally being effective
2 to seal a container before being removed, pose a number
3 of problems for cap manufacturers and packagers. For
4 example, liner stock may be subject to degradation when
5 exposed to elevated temperature, the wrong liner
6 material may be loaded into a machine through human
7 error, the liner stock can have manufacturing defects,
8 exhibit a limited shelf life, pose splicing problems
9 when roll stock is used, may distort into a potato chip
10 configuration so as to not feed properly or be
11 maintained in a cap during bulk shipment of caps, may
12 not achieve a good seal on a bottle, may be mis-punched
13 when formed from strips or roll stock, and may misfeed
14 so that no liner or double liners are assembled into a
15 cap. In sum, liners may pose the most difficult and
16 numerous quality control problems for a cap
17 manufacturer compared to the cap itself.

18 From the foregoing, it will be understood that
19 there exists a need for an improved flap dispensing cap
20 that can be used without a liner while limiting entry
21 of moisture into the container and resisting unintended
22 sifting of product when the flaps are closed. The
23 desired cap must be capable of being mass produced with
24 multi-cavity molds to reduce production costs and be
25 competitive in the marketplace.

26 SUMMARY OF THE INVENTION

27 The invention provides an improved flap style
28 dispensing cap with a construction that enables it to
29 be used without a liner but which has a flap plug and
30 aperture structure that, when closed, excludes moisture
31 and resists sifting. Additionally, the flap plug and
32 aperture structure is advantageously capable of

1 avoiding excessive resistance to flap opening and
2 closing action.

3 One aspect of the invention involves the precise
4 location of each flap plug or seal relative to its
5 associated dispensing opening. This condition is
6 obtained, according to the invention, by molding both
7 the plug and aperture with tooling elements all mounted
8 on the same mold side. In this manner, the related
9 tooling elements forming the plugs and apertures can be
10 very closely aligned with one another and their
11 relative positions are essentially unaffected by what
12 happens on the opposite side of the mold.

13 The resulting accuracy of the relative locations
14 of the plugs and apertures is, by virtue of the
15 invention, an order of magnitude greater than that
16 existing in the prior art. This positional accuracy
17 enables the manufacture of caps that can have a
18 moisture vapor and sift-resistant seal and that can be
19 opened or closed with moderate forces. These opening
20 and closing forces are very important from the
21 standpoint of the ultimate user because excessive
22 opening force can result in broken fingernails or other
23 frustrations; excessive closing force can be similarly
24 troublesome. The low force associated with opening and
25 closing of the flaps is attributable to, besides the
26 positional accuracy of the plugs and holes, plug and
27 aperture geometry that produces a light contact seal
28 and full seal engagement only when a respective flap is
29 very close to its fully closed position. A cap
30 constructed in accordance with the invention can be
31 used with a shrink band or wrap to secure the closure
32 to a bottle and secure the flaps closed so as to
33 produce a tamper-evident package.

1 BRIEF DESCRIPTION OF THE DRAWINGS

2 FIG. 1 is a perspective view of a cap of the
3 invention shown from the spoon opening side with the
4 flaps open;

5 FIG. 2 is a perspective view of the cap shown from
6 the shake opening side with the flaps open;

7 FIG. 3 is a plan view of the cap with the flaps
8 open;

9 FIG. 4 is a cross-sectional view of the cap with
10 the flaps open taken in the plane 4-4 indicated in FIG.
11 3;

12 FIG. 5 is a fragmentary cross-sectional view on an
13 enlarged scale of a portion of the spoon opening and
14 associated plug with the spoon flap closed;

15 FIG. 5A is a fragmentary view, on a much enlarged
16 scale, of a typical sealing fit of the spoon plug and
17 aperture;

18 FIG. 6 is a fragmentary cross-sectional view on an
19 enlarged scale of a typical sift hole and associated
20 plug with the shake flap closed;

21 FIG. 6A is a fragmentary view on a much enlarged
22 scale, of a typical sealing fit of a shake plug and
23 aperture;

24 FIG. 7 is a cross-sectional view of mold parts
25 used to manufacture the disclosed cap;

26 FIG. 8 is an elevational view of a package,
27 partially in section, utilizing the disclosed cap; and

28 FIG. 8A is an enlarged fragmentary section view of
29 a part of the package of FIG. 8.

30 DESCRIPTION OF THE PREFERRED EMBODIMENT

31 Referring now to the figures, a cap or closure is
32 shown at 10. The cap 10 is preferably made by an

1 injection molding process, generally known in the art.
2 The material of the cap can be polypropylene or other
3 suitable thermoplastic material used in the packaging
4 industry. The illustrated cap 10 is unitary, being
5 made in one piece, and has a short cylindrical shape.
6 The cap 10 comprises a generally circular end wall 11,
7 cylindrical skirt 12, and flaps 13, 14. The skirt 12
8 can be formed with internal threads 16 that enable the
9 cap 10 to be screwed onto the complementary neck finish
10 of a bottle, jar or other container 17 (FIG. 8). The
11 illustrated version of the cap 10 has two flaps 13, 14,
12 for dispensing dry particulate product out of the
13 associated container 17. One flap 13 is for spooning
14 or pouring product, and the other flap 14 is for
15 shaking, sifting, or sprinkling product from the
16 container.

17 The illustrated cap 10 is a nominal 53 mm size and
18 has a nominal wall thickness of .050". As shown in
19 FIGS. 1 and 2 and elsewhere, the end wall 11 has a
20 relatively large spoon or pour dispensing aperture or
21 hole 18 on one side (with reference to a chordal area
22 19 where the flaps 13, 14 are joined to the end wall 11
23 by living hinges 21, 22) and a plurality of shake
24 dispensing apertures 23 on the other side. The spoon
25 aperture 18 is preferably large enough to accept a
26 teaspoon or larger spoon for spooning out product from
27 the container 17 on which the cap 10 is fitted. Where
28 the opening 18 is an "option" intended for pouring, for
29 example, it can be somewhat smaller than that
30 illustrated, but is still large compared to the wall
31 thickness of the cap, e.g. having a dimension greater
32 than about ten (10) times the cap wall thickness. A
33 further option for the cap is to substitute a plurality
34 of sift or shake holes with appropriate plugs, for the
35 spoon aperture 18 which are normally of a size

1 different from the sift holes 23. The sift holes or
2 apertures 23, which can vary in number as needed or
3 desired, are sized to efficiently and controllably
4 dispense product from the container 17 when the
5 container is inverted and shaken.

6 FIGS. 5, 5A, 6, and 6A illustrate details of
7 hollow plugs 26, 27 on lower sides of the flaps 13, 14,
8 respectively. As shown, walls 28, 29 of the plugs 26,
9 27 are relatively thin compared to their depth measured
10 in a direction perpendicular to the nominal plane of
11 the associated flap. The plug 26 for the spoon opening
12 18, like the spoon opening 18, is D-shaped but these
13 elements as mentioned can have other shapes. The plugs
14 27 for the sift holes 23 are preferably identical to
15 one another and are of circular or annular form. The
16 distal ends of the plug walls 28, 29 are rounded and
17 the interior and exterior surfaces 31, 32 and 33, 34 of
18 the walls are slightly divergent, each about 4° from a
19 line perpendicular to the plane of the respective flap
20 13, 14. Alternatively, the walls 33, 34 can be
21 perpendicular to the plane of the respective flap.

22 The dispensing apertures or holes 18, 23 are
23 bounded by surfaces 36, 38 characterized by exaggerated
24 draft-like configurations so that the apertures are
25 widest adjacent an upper surface 41 of the end wall 11.
26 The apertures 18, 23 adjacent an inner surface or
27 underside 42 of the end wall 11 have aperture surfaces
28 37, 39 more closely aligned or parallel with the axis
29 of the cap at the center of the skirt 12. These narrow
30 surfaces 37, 39 are the areas against which the plugs
31 26, 27 seal.

32 The hinges 21, 22 are parallel to one another and
33 lie along chordal lines relative to the circular end
34 wall 11 when seen in plan view. The hinges 21, 22 are
35 situated above the plane of a main area of the end wall

1 11 so they are adjacent the plane formed by upper
2 surfaces 46, 47, of the flaps 13, 14 when the latter
3 are closed. The flaps 13, 14 are releasably held in
4 closed positions by depending catches 48, 49 that
5 interact with complimentary receiving areas 51, 52 on
6 the end wall 11.

7 In FIG. 7 there is shown a somewhat schematic
8 arrangement of a mold for producing the illustrated cap
9 10. The mold parts are shown in a fully closed
10 position where they define the mold cavity. The mold
11 apparatus separates or opens across a plane designated
12 by the numeral 55 in FIG. 7. Mold parts below the
13 plane 55 are stationary on a mold half or platen (not
14 shown) while mold parts above the plane 55 are carried
15 on the moveable mold half or platen (not shown).
16 Molten plastic is injected through a gate 56 into the
17 mold cavity at the underside of the end wall 11 in the
18 chordal area 19 that the hinges 21, 22 overlie. The
19 cap end wall 11 and skirt 12 are formed internally by a
20 threaded core 57. The principal areas of the upper
21 surface 41 of the end wall and undersides 61, 62 of the
22 flaps 13, 14 are formed by a pair of main slides 63,
23 64. An upper surface 66 of the chordal area 19 and
24 upper surfaces 46, 47 of the flaps 13, 14 are formed by
25 a center flap form 67. Auxiliary slides or sub-slides
26 68, 69 carried in the main slides 63, 64 form the
27 perimeter or boundary surfaces 36, 37 and 38, 39 of the
28 dispensing apertures 18, 23. The auxiliary slide 69
29 additionally forms portions of the upper surface 41 of
30 the end wall surrounding the shake apertures 23.

31 Study of FIG. 7 and the preceding discussion
32 reveals that the plugs 26, 27 on the underside of the
33 flaps 13, 14 are formed by the respective main slides

1 63, 64. The cap 10 is released from the mold by first
2 withdrawing the auxiliary slides 68, 69 upwardly in the
3 orientation of FIG. 7 by linkages or cams, for example,
4 and then withdrawing the main slides 63, 64
5 (horizontally in FIG. 7) by linkages or cams, for
6 example, and then by separating the platens at the
7 plane 55. A stripper ring 70 forces the cap off the
8 threaded core 57 in a known manner.

9 It will be seen that the boundaries or peripheries
10 of the dispensing apertures 36, 37 and 38, 39 and their
11 respective plugs 26, 27 are formed by tooling elements
12 of the mold situated on the same mold half or platen.
13 This arrangement is unusual for caps of the general
14 type described, i.e. where the flap hinge is spaced
15 inwardly from the periphery of the closure and the flap
16 is molded within a projection of the plan view of the
17 end wall 11. For example, the flaps in the illustrated
18 case are molded at 90° to the plane of the end wall 11.
19 Normally, in the prior art the apertures are formed by
20 tool elements on one part or platen and the plugs are
21 formed on the other mold part or platen. The disclosed
22 arrangement where the plugs 26, 27 and apertures 18, 23
23 are formed by elements on the same mold part or platen
24 yields much greater precision in the relative positions
25 of the plugs and apertures in the molded product. This
26 positional accuracy enables the plugs 26, 27 and
27 apertures 18 and 23 to be sized for a very light
28 interference or touch fit of about .0015 to .004", for
29 instance, interference across a diameter of a circular
30 plug or in the case of the spoon opening 18 between
31 opposite sides of the opening.

32 The light or touch fit between the plugs 26, 27
33 and apertures 18, 23 achieved by the invention is

1 advantageous because it does not significantly affect
2 the opening and closing forces required to open or
3 close a flap 13, 14 over that required to release or
4 reset a catch 48, 49. Moreover, influence of opening
5 and closing action force by the plugs 26, 27 and
6 apertures 18, 23 is reduced where the relatively large
7 draft or relief angle of the surfaces 36, 38 exists for
8 a major part of the vertical height of the aperture.
9 There is essentially no interference between the plug
10 and aperture until the part of a plug distal from the
11 flap engages the actual sealing area or surface 37, 39
12 of an aperture. Each sealing area 37, 39, by design,
13 is preferably substantially less in height than the
14 height or thickness of the end wall 11. Sealing occurs
15 only when the catch 48 or 49 is nearly locked onto its
16 receiving area or structure 51 or 52 on the end wall.
17 At other positions of a flap, there is essentially no
18 frictional drag between the flap plugs 26, 27 and
19 apertures 18, 23. The hollow construction of the plugs
20 26, 27 and their relatively thin walls, where their
21 wall thickness is several times less than their height,
22 reduces the forces required to move the plugs into
23 their respective apertures 18 and 23 since the plugs
24 are capable of deforming slightly to conform to the
25 size and relative position of their respective
26 apertures.

27 FIGS. 5 and 6 illustrate a manner by which the
28 relatively "blind" pockets of the mold that form the
29 plugs 26, 27 are assured to be substantially filled
30 with the plastic cap material and by which voids due to
31 trapped gas are substantially avoided. Areas of the
32 mold corresponding to local thin wall areas 73, 74 of
33 the flaps adjacent the pockets forming the plugs 26, 27

1 remote from the gate 56 serve as flow restrictions
2 upstream from those portions of the plug cavity areas
3 remote from the gate so that plastic tends to flow into
4 and through the plug cavity areas before plastic flows
5 completely past a plug cavity. This allows gas to
6 escape a plug cavity before it is closed off by the
7 lead edge of the main flow of plastic through the main
8 part of the flap cavity. In the illustrated case, as
9 shown in FIG. 7, the flaps 13, 14 are molded at 90° to
10 the plane of the end wall 11.

11 FIGS. 8 and 8A illustrate a package formed by the
12 cap 10 in combination with the bottle 17 and a shrink
13 wrap band or label 76. The band 76, in the illustrated
14 example, is relatively short in comparison to the
15 height of the bottle 17, but it will be understood that
16 it can extend along the full height of the bottle to
17 serve as a full label. The band 76, as is known in the
18 art, can be printed with advertising and/or directions
19 for use of the contents of the bottle 17. The band 76,
20 when shrunk by application of heat or other medium,
21 cups over the outer periphery of the flaps 13, 14 to
22 prevent them from accidentally opening or being
23 deliberately opened without evidence of the same in the
24 form of a fracture or tearing of the band.

25 It should be evident that this disclosure is by
26 way of example and that various changes may be made by
27 adding, modifying or eliminating details without
28 departing from the fair scope of the teaching contained
29 in this disclosure. The invention is therefore not
30 limited to particular details of this disclosure except
31 to the extent that the following claims are necessarily
32 so limited.